

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Fibre-Reinforced Plastic or FRP is a composite material consisting of reinforcing fibres thermosetting resins and other materials such as fillers. Glass fibre is generally used as a reinforcing material and polyester resins are usually used as bending agent. An FRP structure typically consists of unsaturated polyester resin. It is applied to a mould in combination with reinforcement, which most commonly glass fibre, to form a part that is rigid, highly durable and low in weight.

By reinforcing the plastic matrix, a wide variety of physical strengths and properties can be designed into the FRP composite. Additionally, the type and configuration of the reinforcement can be selected, along with the type of plastic and additives within the matrix. These variations allow an incredible range of strength and physical properties to be obtained. FRP composites can be developed specifically for the performance required versus traditional materials: wood, metal, ceramics, etc.

In addition, reinforced plastic has its own mechanical properties and physical properties. Type, shape, length and orientation of the reinforcing material can affect the mechanical and physical properties of reinforced plastics. The percentage parameters of the reinforcing material also give effect on the mechanical and physical properties of the reinforced plastic.

Glass Fibre-reinforced Plastic (GFRP) is a composites material combined plastic resin and glass fibre. Glass fibre is used to improve the mechanical strength, resistance to damage from the outside and to maintain a fixed shape. The results of combined both plastic and glass fibre, the high tensile strength is supported. Besides, the properties of

lightweight and good thermal insulation are one of the factor glass composition and modern composite material.

There are many conventional properties of glass fibre-reinforced plastic, for example long fibres are more effective than short fibres. Their resistance to fatigue, creep and wear also depends on the type and amount of reinforcement. GFRP have the ability properties to meet wide-ranging performance specifications and ability to markedly reduce part assembly. GFRP also have high strength at low weight, good impact and compression. The molding part is in close dimensional tolerances. Moreover, it is excellent chemical and corrosion resistance, good thermal insulation and respectable abrasion resistance with ready to bond with dissimilar materials.

1.2 PROCESSING TECHNIQUE

In this study, there is some method that will be use to complete the project such as Moldflow software, Injection Molding machine, and Universal Tensile Machine (UTM).

Firstly, the plastic part design must be analyze before undergoes injection molding process. Moldflow software is needed. It is used to calculate the fill analysis and wrap analysis that includes the molding process, or cooling system.

Then, to fabricate the plastic part with the combination of fibre and nylon at different percentages used is by using injection molding machine. Injection molding is a machine specially in making parts from thermoplastic. The process begins with the injection of molten plastic with high pressure into the desired shape of mold cavity inside the injection molding machine. Then, the part after injection will undergo cooling time by itself and the part can be ejected.

To study on mechanical properties of the glass fibre-reinforced nylon, the specimen formed by injection molding machine will undergo tensile test and impact test. The Universal Tensile Machine (UTM) is used to identify the tensile strength and other characteristic of the specimen.

1.3 PROBLEM STATEMENT

In spite of many advantages of plastics, the better physical and mechanical properties of plastic are needed. So that, reinforced plastics (composites plastics) has produced. Reinforced plastics has produced a good materials with light-weight properties, high levels of stiffness, high strength-to-weight ratio, outstanding fatigue resistance and very impressive corrosion resistance to compare to others most common metallic alloys, such as steel and aluminum alloys. The strength and stiffness of polymers are good by adding fibres of glass, carbon, nylon and etc.

1.4 OBJECTIVES

- To analyze process flow of plastic part modeling for injection molding process by using Autodesk Moldflow Insights software.
- To fabricate the plastic part of glass fibre-reinforced nylon by using injection molding machine.
- To study the mechanical properties of glass fibre-reinforced nylon.

1.5 SCOPE OF PROJECT

This thesis focuses on modeling and properties of glass fibre-reinforced nylon. Nylon is one of the synthetic polymers family that known as polyamides. Nylon is a thermoplastic. Nylons have good mechanical properties and abrasion resistance, self-lubricating and also resistant to all chemicals such as acids and alkalis. I need to analyze the plastic part modeling in commercial programme Moldflow for injection molding process. The analysis from Moldflow must be focus on the different percentage of used for both Nylon and fibre. After the specimen is formed, the mechanical properties need to be studied by tensile test.